**Computer:**
A computer is an electronic device. It consists of various sub-systems such as memory, micro-processor, input system (keyboard) and output system (Printer). It is an extremely powerful device. A computer is a fast and versatile machine that can perform simple to complex functions without intervention by a human operator during the run.

**Advantages of using computer:**
1. It increases the speed of the computation and data processing.
2. It can handle huge volume of the data, which is normally not possible manually.
3. It facilitates copy, edit, save and retrieve the data at will.
4. It further enables validation, checking and correction of data easily.
5. Computer makes it very easy to perform comparative analysis, whether by drawing maps or graphs.
6. The type of graph or map (i.e. bar/pie or types of shades), heading, indexing and other formats can be changed very easily.

**Hardware:**
The hardware components of a computer include:
(a) A Central Processing Unit (CPU) and Storage System
(b) A Graphic Display Sub-system
(c) Input Devices
(d) Output Devices

1. **A Central Processing Unit and Storage System**
The CPU is the ‘mind’ of modern computers. The processor in the CPU executes and processes data and controls other equipments. Hard disk is used for data storage. The Random Access Memory (RAM), the secondary storage such as floppy disks, CD ROM, pen drives, and magnetic tapes are parts of CPU and used for data storage.

2. **A Graphic Display System or Monitor**
A graphic display system or monitor serves as the visual communication medium in all computers.

3. **Input Devices**
The instruction and the data are entered into the computer using the keyboard. Scanners and digitisers of different size and capabilities are also used for spatial data entry.

4. **Output Devices**
The output devices include a variety of printers such as ink-jet, laser and colour laser printers; and the plotters that are available in different sizes ranging from A3 to A0 size.

**Computer Software**
Software is the written program made up of electronic codes and is stored in memory. It performs specific functions as per the instructions given by the user. Operating system forms base of computer such as Windows and Linux. Work software such as MS Excel/Spread sheet, Lotus 1 – 2 – 3, and d – base, Openoffice Math. Arc View/Arc GIS, Geomedia.

**Using MS Excel or Spreadsheet for data processing:**
MS Excel, Lotus 1 – 2 – 3, and d – base are some of the important softwares used for data processing, and drawing graphs and diagrams. MS Excel being most widely used and
commonly available software program and it is also compatible with map-making software
as one can easily feed data in MS Excel and attach it to the map-making software to create
maps.

MS Excel displays the worksheet, which consists of rows and columns. The intersection of a
row and column is a rectangular area, which is called a cell. In other words, a worksheet is
made up of cells. A cell can contain a numerical value, a formula (which after calculation
provides numerical value) or text.

An Excel worksheet contains 16,384 rows, numbered 1 through 16384 and 256 columns,
represented by default through letters A through Z, AA through AZ, BA through BZ, and
continuing to IA through IZ. By default, an Excel workbook consists of three worksheets. If
you require, you can insert more, up to 256 worksheets.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Function</th>
<th>Instructions</th>
<th>Menu</th>
<th>Secondary Menu (from dropdown list)</th>
<th>Keyboard Shortcuts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>For opening a new file</td>
<td>File</td>
<td>New</td>
<td>Ctrl N</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>For opening an existing file</td>
<td>File</td>
<td>Open</td>
<td>Ctrl O</td>
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<tr>
<td>3</td>
<td>Save a file</td>
<td>Give a file name and define where you want to store it (by default, it is c:.../my documents/)</td>
<td>Save</td>
<td>Ctrl S</td>
<td></td>
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<td>Copy</td>
<td>Ctrl C</td>
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</tr>
<tr>
<td>5</td>
<td>Cut, move and paste a set of data</td>
<td>Select the set of data by pressing the left mouse button and dragging it over the set of the data you want to select</td>
<td>Cut</td>
<td>Ctrl X</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Paste a set of data</td>
<td>Take the cursor to the cell where you want to paste it</td>
<td>Paste</td>
<td>Ctrl V</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>For undoing the last action*</td>
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<td>Undo</td>
<td>Ctrl Z</td>
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</tr>
<tr>
<td></td>
<td>For redoing the last action*</td>
<td>Edit</td>
<td>Repeat</td>
<td>Ctrl Y</td>
<td></td>
</tr>
</tbody>
</table>

**Example 1: Data analysis in Excel**

Solving the expression “5 + 6 – 8 – 5”

Step 1: Click on any cell (with the help of mouse).
Step 2: Type =, followed by the expression. Thus, the expression becomes = 5 + 6
- 8 – 5.
Step 3: Press enter key, and you will get the result in the same cell that you had
chosen in Step 1.

Note: The numerical operations can only be performed in excel by first typing =
sign.
Example 2: Calculating percentage in Excel

Step 1: Enter the name of the states in first column (i.e. column A).
Step 2: In Column B, corresponding to each state, enter the size of urban population.
Step 3: In Column C, corresponding to respective state enter the size of total population.
Step 4: In Column D and row 2, type = followed by B2/C2 (that is total urban population of Andhra Pradesh divided by the total population in the same State) and *100 (multiplied by 100). Thus, the expression becomes =B2/C2*100
Step 5: Press enter key. This will give you solution of the expression, that is, the percentage of urban population in Andhra Pradesh.
Step 6: Now you need not to write the formula again for calculating percentage of urban population for other states. Simply, click on the cell D2. This will copy the formula of the first state/cell to all the downward cells you have dragged it over.

(Note: the formula =B2/C2*100 that has been written in cell D2, and becomes B3/C3*100 in cell D3, and so on).

Example 3: Calculating Average in Excel

Step 1: Enter year-wise cropping intensity data in a worksheet.
Step 2: Click on cell B6 using mouse.
Step 3: Click on Insert Menu and choose fx (Function) from dropdown list, this will open Insert Function dialogue box.
Step 4: In the box select a Function, click on Average, and press OK button. This will open another dialogue box called Function Argument.
Step 5: Either enter the cell range of data of the first decade 1950 (which shows year wise cropping intensity in 1950s) in the Number 1 box on Function Argument dialogue box of data, or drag cursor pressing the left button of mouse over the cell range of data.
Step 6: Press OK button on the Function Argument dialogue box. This calculates mean cropping intensity for the decade 1950s in cell B6, where you had put your cursor in the beginning.

Example 4: Construction of Bar Graphs in Excel

Step 1: Enter the data in worksheet.
Step 2: Select the cells dragging mouse (right button pressed) over the cells.
Step 3: Click on Chart Wizard. This will open Step 1 of 4 of Chart Wizard.
Step 4: Double click on the simple bar diagram in the box ‘Chart Sub-type’. This will lead you to Step 2 of 4 of Chart Wizard in which worksheet number and selected data range, and a preview of bar diagram appear. As categories in data are arranged row-wise, therefore, it is row-wise chart construction.
Step 5: Click on the Next radio button, and this will lead you to Step 3 of 4 of Chart Wizard. Here you will find various options for entering ‘title’ ‘name of axes’, options for ‘grid lines’, ‘data labels’ and ‘data table’.
Step 6: When you have finished entering axes titles and legend options, etc., click on Next radio button. This will lead you to step 4 of 4 of Chart Wizard, which will let you choose the location of the constructed bar diagram for the data. Choose ‘As Object in’ and select the same sheet you have entered the data,
Some Important Norms for Data Representation

1. A figure should have its figure number.
2. It should have a suitable title in which time and space it relates to should also be mentioned.
3. Within title or as sub-title, the unit in which the quantities are shown should be mentioned.
4. The title, sub-title, title of axes, legend and the main presentation should be shown with suitable font size and type so that they occupy space in a balanced manner.

Computer Assisted Mapping

The maps may also be drawn using a combination of computer hardware and the mapping software. The computer assisted mapping essentially requires the creation of a spatial database and non-spatial data.

1. Spatial Data

The spatial data represent a geographical space. They are shown by the points, lines and the polygons. To show the location of schools, hospitals, wells, tube-wells, towns and villages, etc. on the map we use points. Similarly, lines are used to show linear features like roads, railway lines, canals, rivers, power and communication lines, etc. Polygons are used to show area features such as administrative units (countries, districts, states, and blocks); land use types (cultivated area, forest lands, degraded/waste lands, pastures, etc.) and features like ponds, lakes, etc.

2. Non-Spatial Data

The data describing the information about spatial data are called as non-spatial data. For example, we can attach the information such as the name, number, facilities, etc.

Mapping Software and their Functions

There are a number of commercially available mapping softwares such as ArcGIS, ArcView, Geomedia, GRAM, Idrisi, Geometica, etc. Mapping software provides functions for spatial and attribute data input. It helps in digitisation of scanned maps, corrections of errors, transformation of scale and projection, data integration, map design, presentation and analysis.